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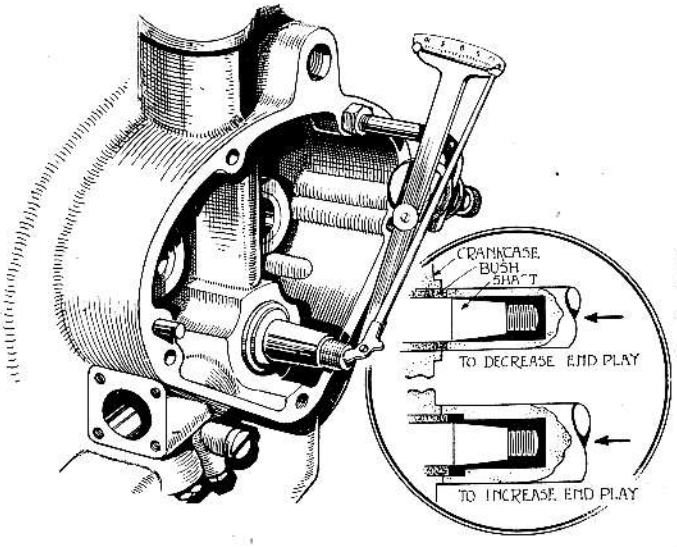
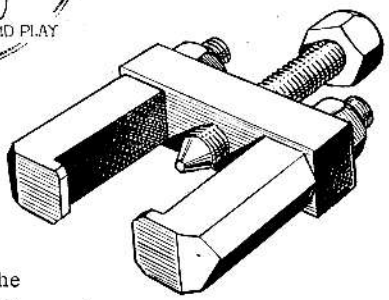
Overhauling The Army-type

Full Instructions Covering Dismantling and Re-assembly



The simple but ingenious gauge used by the "Works" assemblers to measure flywheel assembly end float. (Inset) Approved method of increasing or decreasing end float by movement of the timing gear side main bearing bush.



A simple claw-type extractor recommended for the removal of the half-time pinion.

AS usual in this series, it is to be assumed that the rider effects all the minor running adjustments, so that our remarks refer exclusively to a machine in the workshop for service.

Starting at the top end, the commonest service routine is simple decarbonization and valve grinding, a process not requiring any detailed description.

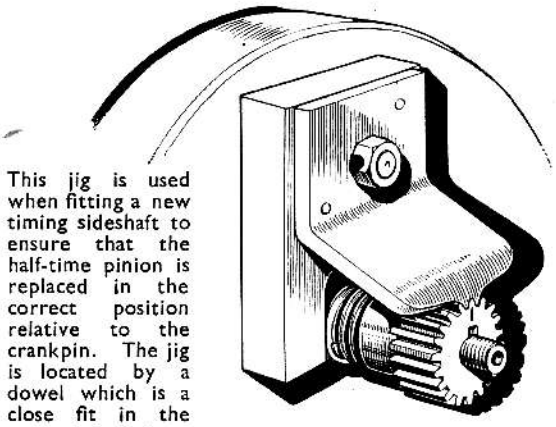
It might be advantageous to point out that the tank must be drained before it is removed, or fuel will be wasted through the balance pipe. There are two types of tank now in service, one with and the other without an instrument panel. On the former type the panel can be slipped out sideways through the hole in the tank without having to disturb the wiring, except for disconnecting the positive lead near the battery, so obviating any danger of a short circuit when the panel is moved. The four bolts securing the tank must then be removed and the tank lifted completely off.

The Rocker Box

Before undoing any of the seven $\frac{5}{16}$-in. diameter rocker box bolts, it is essential that the engine be placed on T.D.C. with both valves shut to avoid any unnecessary strain on the aluminium casting. Also a note should be made that the longest bolt with the short head goes in the centre of the box on the push-rod side.

When the engines are assembled at the works, the composition washer between the rocker box and the head is stuck to the former, but not the latter, with some jointing compound; therefore it is possible that, with care in removal, the joint will not get damaged when the box is lifted. If any doubt exists, a new one must be used, care being taken to fit same the correct way, so that the oil hole in the head face is not masked.

Provided the rocker gear gets its fair share of lubricant, there is little reason for renewing rocker-shaft bushes; it is, however, a simple job. The old ones can be pressed or driven out with a double-diameter drift, the pilot end .490 in. dia. by $\frac{3}{4}$ in. long and the driving end $\frac{9}{16}$ in. dia. by 4 ins. long. The bushes of each rocker can be driven out from one side, but they should be replaced (for preference with the aid of a hand press) from either side and subsequently reamered to $\frac{1}{2}$ in. ± .0005 in.



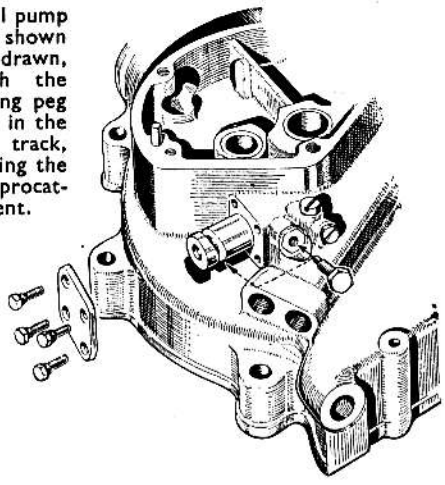
This jig is used when fitting a new timing sideshaft to ensure that the half-time pinion is replaced in the correct position relative to the crankpin. The jig is located by a dowel which is a close fit in the crankpin hole.

A tube, acting as a distance piece between each pair of rockers, actually forms the bearing surface in the bushes themselves, whilst the rockers, splined to the inner shaft, are pulled up tight on to the ends of the tube. The push-rod end rockers are interchangeable with each other, but not with the valve-stem rockers, and vice versa. Occasionally it is difficult to push the rocker tube through the felt washer situated between the two bushes. In such a contingency, a taper mandril will expand the washer outwards into place, and if the mandril is followed through by the tube no trouble should be experienced.

Oil-seal Joints

Four $\frac{3}{8}$-in. B.S.F. bolts, $3\frac{7}{8}$ ins. long, hold the cylinder head to the barrel. Once these are undone and removed the head can be lifted clear towards the off side of the machine. Most probably the push-rod tubes will remain wedged in the head by means of two Neoprene oil-seal joints, each surmounted by a steel washer. These must be removed whilst work is carried out on the cylinder head. Rubber ring joints at the bottom of the tubes are

Model G3 350 c.c. MATCHLESS

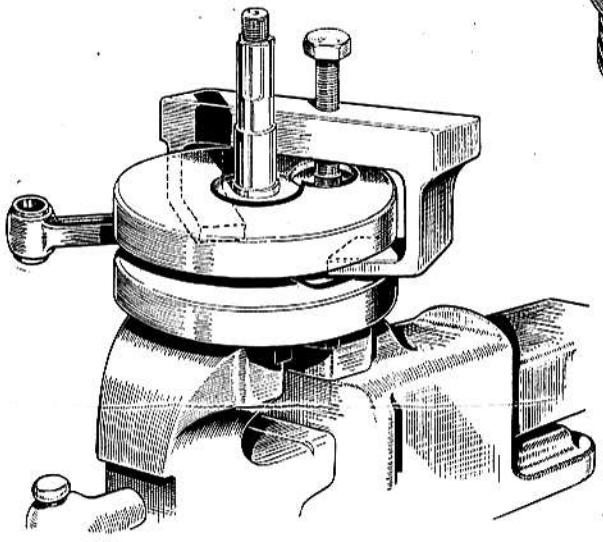


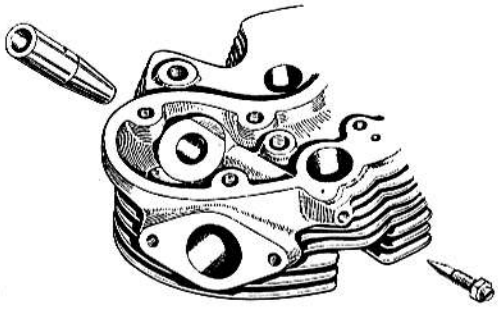
The rotating oil pump plunger is here shown partially withdrawn, together with the screwed locating peg which registers in the plunger cam track, thereby providing the necessary reciprocating movement.

best replaced to make quite sure of a good oil-tight joint; likewise, it is advisable to renew the C. and A. cylinder-head joint each time the head is disturbed. On the other hand, the top Neoprene seals can be used two or three times, provided they are jointed with compound to the push-rod tubes only.

Due to the use of chilled cast iron for valve guides, chromium-plated valve stems and a plentiful supply of oil to these parts, there is little need to worry about renewing the guides. However, in case of need, the valve-stem diameter is .380 in. and the valve guides protrude from the head by $\frac{1}{2}$ in. and $\frac{5}{8}$ in. respectively for the inlet and the exhaust. A double-diameter drift will remove the guides, but a special distance piece to replace them should be made up as shown in the sketch, and do not forget to mate up the oil holes in the head and the guides.

(Below) The massive tool used in the factory to separate the flywheel assembly. With such a tool there is no risk of distorting the crankpin or its bearings in the wheels.





(Left) The inlet valve guide is shown withdrawn. The oil hole in same must register with the drilled passage controlled by the taper adjusting screw. Great care must be taken to replace the face joint washer the right way round so that the small hole leading to the drilled passage is not masked.

The Valves and Springs

So far as the valves are concerned, both have 45-degree seat angles, but the diameter of the inlet seat is 1.465 ins. and that of the exhaust 1.370 ins., so a suitable cutter must be used for each if they need touching up. It is also advisable to check the free length of the valve springs, which should be $2\frac{1}{8}$ ins. for the outers and $1\frac{7}{8}$ ins. for inners. If these dimensions have diminished by $\frac{1}{8}$ in. or more, it is advisable to renew them.

If any work is necessary on the piston, the barrel can now be removed without taking the engine out of the frame. At the same time the barrel can be checked for wear. The standard bore is $2.7185 \begin{smallmatrix} + .0000 \\ - .0010 \end{smallmatrix}$ ins., if the wear at the top of the bore reaches .008 in., the barrel should be bored out .020 in. oversize and a standard replacement piston fitted from stores. The latter (or, for that matter, the original piston) must have the split skirt to the front, whilst the recommended ring end gaps are .006 to .008 in. and the up and down play .003 in.

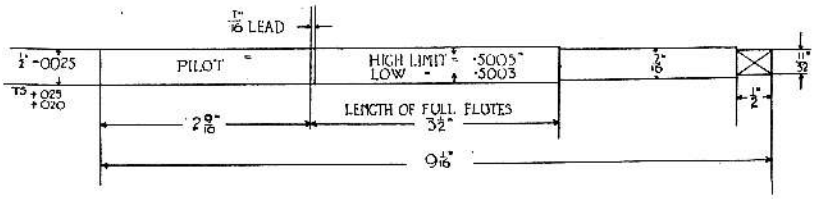
A worn little-end bush must be replaced and the new one reamered to $\frac{7}{8}$ in. $\pm$ .0005 in. so that the pin is an easy push-in fit; the same fit is necessary in the gudgeon pin bosses or else there is a risk of seizure. When replacing the cylinder, a new base-joint washer is essential, and it should be smeared with jointing compound on the cylinder-face joint only. Also care should be taken to see that the release-valve oil feed to the cylinder wall is quite clean and free. A 3 B.A. screw will withdraw the small brass bit from the bottom of the feed hole.

Important

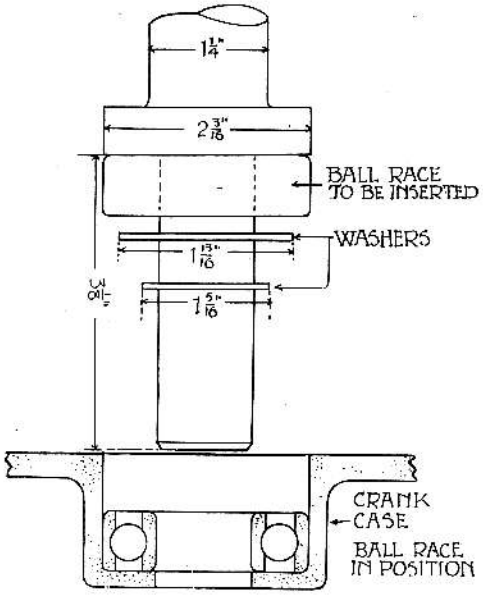
Removing the engine from the frame, as a detailed subject, cannot be included in this article, but one point must be mentioned, namely, the removal of the magneto-drive sprockets. First, the cover is taken off, exposing the chain. Then the nuts can be undone (both have right-hand threads), but the magneto-shaft sprocket *must* be supported and held by means of the two flats on the boss situated outside the chaincase, otherwise the armature shaft may be bent. The driving sprocket can be prised off with a pair of tyre levers hooked at the ends, but the driven sprocket must be removed with a proper magneto sprocket puller, or the case may be broken.

When a bottom overhaul is contemplated the engine is removed from the frame as a complete unit. Seven $\frac{1}{4}$-in. by 26-thread cheese-headed screws hold the timing cover to the crankcase, and when these are undone the cover can be withdrawn, followed by the two cam wheels. The paper washer on the face joint must be

renewed on reassembly with some compound to stick it to the cover. There is no need to note the timing because both camwheels and mainshaft pinion are marked. The mainshaft pinion is secured to its taper by a $\frac{7}{16}$-in. by 26 *left-hand threaded* nut. Having removed this, the pinion can be drawn with a special two-jaw puller, as shown in the sketch. This can be supplied by A.M.C., Ltd., or made up from drawings which they will supply.



A pilot reamer to the above dimensions will prove invaluable when fitting new timing gear bushes.

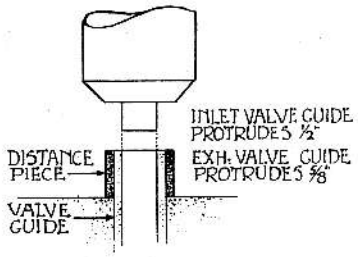


The approved system of mounting the inner drive side main bearing on a pilot drift prior to pressing the bearing into the case. It is essential that the washers shown be assembled in the positions illustrated.

It is now most important to take out the oil pump plunger before any attempt is made to split the crankcase. A small hexagonal-headed screw will be found underneath the rear of the timing chest and the plain end of this runs in an eccentric groove round the plunger. This screw is first removed, followed by the rear cover and then the front cover, when the plunger can be pushed out from the front. The crankcase can now be split.

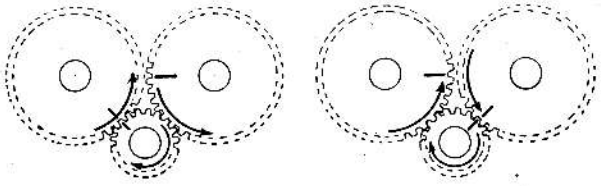
All four cam-wheel bushes can be knocked out with a double-diameter drift, the pilot being .495 in. diameter by $\frac{1}{2}$ in. long and the handle or main drift $\frac{9}{16}$ in. diameter by 4 ins. long. The exhaust cover bush has a steel disc on the outside which must first be removed with a $\frac{3}{8}$-in. diameter bar from inside and later replaced with some jointing round the edges after reamering the bushes. For this purpose a pilot reamer, as shown in the drawing, should be used, with the timing cover bolted to the timing side of the crankcase. Note also which way the cover inlet cam bush is fitted, because it has a worm thread designed to sling oil back into the timing chest.

If it is necessary to remove worn tappet guides the



By the use of distance pieces of suitable depth, new valve guides can be pressed into position. The difference between external lengths of inlet and exhaust guides should be noted.

To time the valves correctly, the marks in half-time pinion and inlet cam wheel should first mesh (left) then the pinion should be partially rotated until its mark mates with the corresponding mark on the exhaust cam wheel.



case must be heated and the guides, complete with tappets, tapped out with a soft drift from inside the timing chest. When replaced, they must protrude $\frac{5}{32}$ in. from the face of the crankcase.

A phosphor-bronze bush in the timing side of the crankcase forms one main bearing. It is of the utmost importance that this is assembled correctly. The old one must be pressed out from the flywheel side and the new one inserted in the same manner, chamfered end first, whilst the crankcase half is supported on a tube $1\frac{1}{2}$ ins. outside diameter, $1\frac{1}{4}$ ins. inside diameter, and 1 in. long, placed inside the timing chest around the main bearing boss. The new bush should be pressed in until $\frac{1}{32}$ in. is protruding inside the crankcase. The drift for performing both these operations should have a pilot .870 in. diameter by $\frac{3}{4}$ in. long, and the main drift part $\frac{15}{16}$ in. diameter by 2 ins. long or more to suit the press.

The drive-side main bearings are both ball races spaced by distance washers; they can be removed with a plain drift $1\frac{1}{4}$ ins. diameter by 3 ins. long and replaced with a pilot drift. The pilot must be 1 in. in diameter by $3\frac{1}{8}$ ins. long and the shoulder for pressing the bearings home $2\frac{1}{4}$ ins. diameter recessed $\frac{1}{16}$ in. deep round the pilot to clear the central journal. The crankcase can be heated if the bearings are a tight fit.

The "Bottom Half"

The crankcase breather can well be examined and cleaned and when replacing the body the steel disc should be held central by grease to prevent it getting damaged.

Splitting the flywheel assembly calls for a puller, as shown in the sketch. The crankpin has parallel bosses which are a very tight fit in the flywheels. If, by any chance, the timing side mainshaft needs replacing, this must be done with the aid of a special jig (as shown in the sketch), which uses the crankpin hole for locating the timing pinion, thus ensuring the correct valve timing. A.M.C., Ltd., can supply these jig drawings so that any workshop can make one up.

When fitting up a new big-end assembly the crankpin nuts must be tightened evenly in easy stages or the

MATCHLESS

350 c.c. O.H.V. W.O. 40 G3 Model

(1) *Valve clearances (cold)*	*Nil.*
(2) *Valve timing*	*Inlet opens 20° before T.D.C. closes 67° after B.D.C. Exhaust opens 78° before B.D.C. closes 28° after T.D.C.*
The above must be checked when the valve clearances are set to ·016 *in.*	
(3) *Magneto timing*	*Points open* $\frac{3}{8}$ *in. before T.D.C. with control lever fully advanced.*
(4) *Reamered size of O.H. rocker bushes*	·500 *in.* $^{+\ \cdot0005\ in.}_{-\ \cdot0005\ in.}$
(5) *Valve guides protrude from cylinder head.*	*Inlet* $\frac{1}{2}$ *in. Exhaust* $\frac{5}{8}$ *in.*
(6) *Cylinder bore in inches*	2·7185 *ins.* $^{+\ \cdot0009\ in.}_{-\ \cdot001\ in.}$
Rebore + ·020 *in. when cylinder bore is* + ·008 *in. on the above figures.*	
(7) *Camshaft bushes. Reamered dia.*	·500 *in.*
(8) *Tappet guide height from crankcase face*	9/32 *in.*
(9) *Internal diameter timing side main*	$\frac{7}{8}$ *in.* $^{+\ \cdot00075\ in.}_{+\ \cdot00025\ in.}$
(10) *Flywheel end play*	·025 *in.*

central journal, which is a bush pressed on to the pin, will become forced to one side. The oil hole in the timing side must match up with that in the flywheel, and when fully tightened the rod must be free on the pin. If it is not it should be dismantled and the big-end liner lapped out.

In normal circumstances the flywheels can be rough-aligned in a vice and later finally trued up on Vee blocks or between lathe centres, until the main bearing journals run within .001 in. from dead true. A normal pointer gauge and clock are suitable for this purpose, as illustrated in previous articles.

All the work that now remains on the crankcase is to check the main-shaft end clearance, which should be not less than .025 in. To do this the flywheel assembly is placed in the crankcase, which is then bolted together. A pointer gauge and clock are attached to the timing cover as shown in the sketch, and the clock plunger placed against the end of the mainshaft. If there is too much end play, the mainshaft bush must be knocked into the crankcase with a blank-ended tube fitting on to the end of the bush and over the end of the mainshaft. If there is not enough play, a blank-ended tube fitting *over* the bush and against the boss surrounding the bush will, when hit, "shock" the bush outwards, so increasing the crankshaft end float.

Retiming of the valves is carried out by first setting the mark on the mainshaft pinion so that it meshes with that on the inlet camwheel, then turning the engine forward about 20 degrees so that the pinion mark engages with the mark on the exhaust camwheel. There should be no need to check the timing but, if necessary, the correct settings will be found in the data table.

Retiming of the magneto must be done with the control cable in the fully advanced position. The points should just begin to open $\frac{3}{8}$ in. before the piston reaches top dead centre, with both valves closed.

Any other assembly work should be perfectly simple to the mechanic who dismantled the engine.